A Narrative of Montreal Geology, Part 1: Introduction
By: Nathan Ferguson and Michael Kishchuk

The oldest histories of a place are written not in words, but in rocks. What do the rocks of Montreal tell to those who try to listen? How can we translate their stories, and share this lithic narrative? Co-written by an anthropologist and a geologist, we present here an introduction and two complementary myths of Montreal. These are origin stories as told by strata and sediment. Drawing upon scientific understanding and a deep sense of place, this is an early effort in convergent poetry, inspired in equal parts by swarm ethnography, standpoint feminism, convergent evolution, and the prolific artistry of biodiversity. We hope you enjoy.

What kind of narrative for a narrative of Montreal geology?

Storytelling has always been a part of our approach to knowing and naming the rocks. In 1863, Sir William Logan, child of a young Montreal, published his masterpiece *Geology of Canada*. The text is a classic in its field — certainly the most authoritative report on Canadian geology of its time, it remains a central artefact in the history of North American natural sciences. The document achieves a couple of things. First of all, it is a broad and extensive review of the geological history and character of the Canadian landscape and underground. Second, it obliquely captures some of the fractious controversies of the professionalisation of geology in the North Atlantic over the later half of the 19th century. Thirdly, it was a government-funded report meeting practical and political objectives. And finally, it implicitly and explicitly works to solidify the biostratigraphic research program in geology,[1] more or less taking that principle for granted, treating it as if it were a consensus. In other words, we can see the text as part of the closure of a famous black box, the solidification of a new fact, and one of the 'last words' of a century-long battle in the sciences to determine the age of the world. At stake, then, is a new temporality — a new way of seeing and reading the past through the present face of the earth.

According to historian of science William Eagan, Logan's *Geology* can (and should) be read as an example of narrative science — an argument for fact that claims its authority as a result of its ability to 'make sense' as a coherent story. Eagan argues for this reading on the basis of Logan's choice to structure the *Geology* as a historical and sequential account of the rocks in Canada (as opposed, for example, to a catalogic structure by type of rock, or a geographical sequence by province). In this era of geology, where technological and infrastructural conditions were such that the rocks themselves were still subject to a great deal of 'noise' — unclear data, imperfect measurement, and inaccessible regions — Eagan suggests that Logan wielded this narrative structure to bring order to an unruly landscape and the unruly mass of quantitative knowledge it

[1] *Stratigraphic* geology is concerned with the study of rock layers (strata), and their interpretation in terms of a general sequential time scale. *Biostratigraphic* geology is concerned with assigning ages to rock layers according to the fossil assemblages found within a given unit of rock.

had so far produced. In this case, storytelling becomes a scientific technique, calling on the ordering powers of the human imagination to bring forth the ‘evident’ design and meaning of a given physical environment or natural situation. Drawing on a heterogenous and disparate body of information, Logan can nonetheless become a kind of conduit for the sense and story of the earth; the rocks can suddenly speak or write themselves through him, revealing their “temporal sequence through stratigraphic unravelling of physical order” (Eagan 154).

Through this spokesmanship for the natural world, Logan also operationalizes (and thus normalizes) a certain kind of taxonomy: in his story, names for rocks are carefully chosen, either to demonstrate allegiances to a specific way of working (a specific way of reading the rocks), or else to demonstrate alliances to specific working groups (a strategic positioning of Canadian geology as its own school in the contentious terrain between Britain and the United States).

As a scientific text with a political project, Logan’s geology and the names it seeks to harden are inextricably bound up with the colonial effort. Proposing new names for Logan means erasing past ones. There are other, older ways of knowing the rocks — better or worse is not important; they were their own, they were different, and diversity in naming is a precious thing. We want this text to amplify the voices of contemporary efforts to recover these other names, to read them against the colonial ones, to practice resurrection and cross-pollination. Read Johnathan Ferrier, read Albert and Murdena Marshall, read Kim TallBear. Read Liz Howard. Let the new names get caught in your throat, speak the other names with a clear voice. Whisper your own names into the earth, secretly, bury them deep, and carry them with care and in cherishing.

Names are important — in making this claim we are inspired by Ursula K. Le Guin's fantasy of names as underpinning the magic and logic of the world in *A Wizard of Earthsea*. Logan was a great storyteller (or at least a very well-positioned one): through story, he won his naming games, and he too has found his way into the taxonomy of the rocks. Almost as if he were assumed into the ranks of the saints and angels, Logan finds himself immortalised in a number of Loganite and Weloganite minerals present in the Canadian earth (not to mention the country’s tallest peak, Mount Logan in the austere and gorgeous Kluane chain). Imagine that — a reading so persuasive and so influential that the school which he inspired ended up discovering and reading him into the very text, the very ground that he spent his life working to decode!

Pictured above is a yellow Weloganite crystal dug up from the Francon quarry in the Northeast of Montreal. Not all storytellers of Montreal geology have had the same luck as Logan, the same access, or the same leverage. The fullness of time has given Ann Phyllis Sabina Stenson her flowers, but the Francon quarry was not initially so yielding or generous to her. When she arrived in Montreal to work for the Geological Survey of Canada (a successor to Logan's Geological Survey of Montreal), women were barred from working in or around the site, and Sabina had to pay quarry labourers informally to bring her samples from the earth. In 1966, Sabina's x-ray powder diffraction tests turned up a mineral that was nowhere to be found in the existing databases. This was ($Sr_3Na_2Zr(CO_3)_6 \cdot 3H_2O$) — a new rock, asking through her instruments for its own name at last. Sabina called the mineral Weloganite.

Fifteen years passed, and times had changed: digging was no longer only a man's work, and Sabina by this point was namegiver of nine new crystals (Montroyalite, Hochelagite, and Franconite among them). In 1980, the geologist James Jambor identified ($Na_4Zr_2TiO_4(CO_3)_4$) in the Montreal earth — Sabinaite.

What kind of stories do the rocks want to tell? How can we try to be more responsible listeners? We have a few ideas. First of all, let us continue to invite more into the listening. The politics of access in science are as contentious and bitter as ever; let Ann Sabina's story testify in favour of open source, of increased mobility, and of the careful and patient deconstruction of the walls, fences, and policies that keep us from getting closer to the land. Second, let us attune ourselves to the rhythm and style of the rocks' speaking. If there are in fact narratives to unearth from the geology of Montreal, they will probably be slow stories, long stories, stories of transformation under pressure — stories of explosion punctuating the deeper stories of dormition. To those familiar with the older practices of poetry, the transformation of Logan into a conduit for the story of the rocks will not be very strange — here, Logan is serving as a *poiētḗs*, vessel and voice of the muses. In his case, the muses sing the story of the earth, the *lógos* of the *gê*.

In what follows, we have tried to follow these speculative principles of a more responsible storytelling. We have opted for multiplication of perspectives: the first text is a myth-essay by a geologist-poet; the second is an essay-poem by a geographer of myth. Both authors are interpreters of space, but we participate in different schools of interpretation. In other words, this is an early effort in convergent poetry, a style of storytelling inspired in equal parts by swarm ethnography, standpoint feminism, convergent evolution, and the prolific artistry of biodiversity. In this writing, we have tried to capture some of both the slowness and the drama of the rocks.

A Narrative of Montreal Geology, Part 2: Myth of Montreal (as told by the rocks)
By: Nathan Ferguson and Michael Kishchuk

The oldest histories of a place are written not in words, but in rocks. What do the rocks of Montreal tell to those who try to listen? How can we translate their story, and share this lithic narrative? Co-written by an anthropologist and a geologist, we present here two complementary myths of Montreal. These are origin stories as told by strata and sediment. Drawing upon scientific understanding and a deep sense of place, this is an early effort in convergent poetry, inspired in equal parts by swarm ethnography, standpoint feminism, convergent evolution, and the prolific artistry of biodiversity. We hope you enjoy.

What kind of narrative for a narrative of Montreal geology?

In the beginning, there was a joining. Two continents came together, sutured by a keloid scar of rock. The Grenville orogeny raised a range of mountains, Himalayan in stature, and greatly deformed in their depths. The combination of continents made the planet binary: ocean or rock. Supercontinent Rodinia. As the force of the collision faded, and mountains eroded to rounded hills, the continents split apart, drifting. An ocean opened between them, ancestor of the Atlantic. Iapetus. Offshore, piling up like dust on the continental shelf, sediment accumulated. First sand, the rubble of mountains, carried by rivers. Then silt and mud, drifting down through the depths, settling on the shelf. Finally coral and ooids, carbonate growing and precipitating. Sandstone, shale, limestone; sediments were laid over the deformed remains of mountains, like pages in the archive of the planet. Submarine deposition on the St. Lawrence Platform. Then a series of orogenies — Taconic, Acadian, Alleghenian — closed the Iapetus and lifted new mountains skyward. Montreal lay at the margin of this uplift, and though only distantly affected, it was now shadowed by new peaks. These folded and banded rocks became the spine of Pangea. Appalachian Mountains. Later, below the surface, magma intruded through layers of sedimentary rock, enormous plutons that rose like globules in a lava lamp. Though never emerging at the surface as volcanoes, they baked and fractured the surrounding rock. The long narrow fractures filled with molten rock, which crystallised as it cooled, and eventually the bulbous subterranean magma chambers solidified too. They became syenite and gabbro, coarse-grained and crystalline, resistant to erosion. Gradually, as the surrounding land wore away, these cooled plutons became prominent, islands of rock above a sea of soil and forest. Monteregian Hills.

Much later, glaciers descended from the Pole, vast lobes of ice sweeping southward across the continent. They stripped away soil, and bedrock too, bulldozing the terrain, scraping smooth everything except the resistant Monteregian Hills. Laurentide glaciation. The great weight of the ice sheets, kilometres thick, depressed the continent, pushing it downward into the viscous mantle like a laden boat. When the planet warmed and the glaciers retreated, they left behind moraines of till and drumlins of gravel. Then seawater flooded the lowered basin. Champlain

Sea. Relieved of its frozen cargo, the continent slowly rebounded, and saltwater turned brackish turned fresh, as a sea became an estuary became a river, draining off the edge of the gradually rising continent. The current carved elongate islands from the glacial sand and mud, and its banks became fertile soil. St Lawrence River.

Today, the river flows through old seafloor sediments, across the platform of a much older, lithified ocean. Bounded by the remains of ancient mountains on both sides, Mount Royal rises above the stream of the St Lawrence, the resistant remnant of a cooled pluton. Made from welded continents and from the bottom of the sea, shaped by the forces of mountain-building and by the movement of ice, a mountain on an island in a river. Montreal.

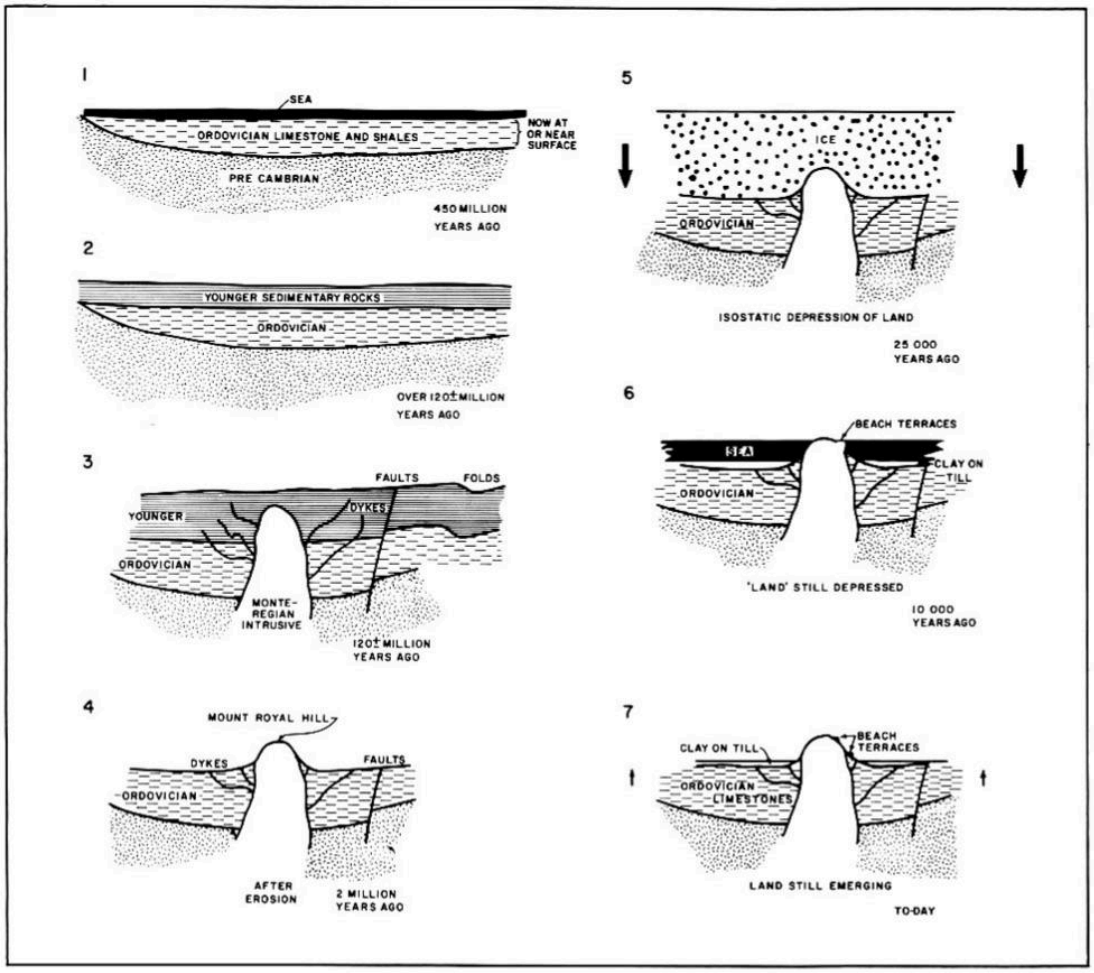

Figure 8. Sections showing the principal events and features of the geological history of Montreal. The sedimentary rock units shown as Ordovician include the Cambrian sandstone (from Grice and Durand, 1979).

A Narrative of Montreal Geology, Part 3: Geomythologies
By: Nathan Ferguson and Michael Kishchuk

The oldest histories of a place are written not in words, but in rocks. What do the rocks of Montreal tell to those who try to listen? How can we translate their story, and share this lithic narrative? Co-written by an anthropologist and a geologist, we present here two complementary myths of Montreal. These are origin stories as told by strata and sediment. Drawing upon scientific understanding and a deep sense of place, this is an early effort in convergent poetry, inspired in equal parts by swarm ethnography, standpoint feminism, convergent evolution, and the prolific artistry of biodiversity. We hope you enjoy.

What kind of narrative for a narrative of Montreal geology?

First there was nothing, then there was everything. God stepped back from the canvas and saw that it was ground.

Or, God stepped back from the ground and saw that it was grinding, and groaning, and growing in its slow and knowing ways; they stepped back from the canvas and knew that it was good.

* * *

Now sing, muse — sing, goddess:

Sing the story of the archipelago, the aquapelago,
Sing the story of the islands, rising out of the water like a bird.
Sing the story of the ancient and tortured waters, the trouble of the faults and fluencies.

Rage — tell the story of the islands at the raging convergence, the rage of the confluence,
Tell the story of the two great rivers,
Outaouais and Saint-Laurent, Ottawa and Saint Lawrence,
Kitche Zibi and Kaniatarowanenneh, great river and big waterway.

Mud — tell the story, muse, of the plain, the soft and flat plain
Below the shield, the great and boundless shield,
Below the shield and between the chains, two spines lifting up out of the muscular earth.

Retreat — tell the story of the old Archipelago gathering new siblings,
Sing the story of the new mudsoft islands piling up like filth among the elder rocks,
An old sea bed churned and turned by the raining and the draining,
The low chain extending with the current as a minor sea retreated into the vast Atlantic.

Pressure — tell the story, muses, of the great and hidden pressures,
The tectonic urges breaking out against the surface, the thick liquid rock piling up against the sky.
Tell the story of the unfolding pressures, under a thousand and a thousand rosy-fingered retreats of the dawn,
Tell the endless story of the days and the ages, the long birth of Montreal, Tiohtia:ke, a thousand other names; our home.

* * *

Our islands belong to the foot of what they call the Grenville province. Grenville, a chunk of the shield — the granite swamps and tangled woods that go on and on, above the River, above the Great Lakes, above the Plains and the Prairies, the shield stretching like the lover's back, all the way to the distant peaks of the Rockies. Grenville, a shoulder on this back, born of collision. This ancient shield, the remnants of an older-still mass, a continent from the deepest past: they call it Laurentia. And as Laurentia wandered through the ocean waters, wandered under the oldest skies, the great traveller would meet with others; imagine now the fury of great Laurentia's collisions with these ancient eyeless lands. In the heat of these collisions, mountains upon mountains were piled up to the heights. Here is Grenville, the ancient roots, all that remains of those old and lost towers.

Grenville stretched and widened; the hidden forces of the darker depths pulled it apart. The rock obeyed the laws of its going, and the water obeyed the laws of its flowing, and the waters flowed in to the waiting basin, and an ancient sea was born: they call it Iapetus (Iapetus, the titan, son of Ouranos and Gaia, son of the sky and the land; Iapetus, father of Atlas, the Atlantic, father of Prometheus; old god of craft and of death; pillar of the Western sky — but these are other stories). Iapetus digested the mud and the silt and the rocky filth of a thousand ages; storms beyond belief and before the memory of the oldest creature rocked its thoughtless waters; and Iapetus digested this ancient mud into rock, the belly of the waters giving birth to stone.

Laurentia sailed on. Its next collision was with what today they call Africa — as friend or foe, the legends tell the story in many ways. And it is at this meeting of lands that the next great chain was born: today they call it Appalachia, others know it still as Shaconage and Wobanadenok. As these noble and friendly peaks broke a new horizon, up rose as well a flat and sturdy platform. Now they call the platform Saint Lawrence, a broad land stretching out towards the mouth, the gulf, the sea.

Upon this platform is written the latter history — the newer history — of our islands and the lands around. The years in their hundreds of millions came and went. From the hot depths of the earth, below even the blades and plates that cast Laurentia around on its odyssey, there came the time of the Igneous Intrusions. The unthinkable shafts, their magmatic flow: hot rock from the burning at the centre of things shot up like joy through the caverns and the passages, breaking into the sight of the sun and crystallising like ice into hills and pillars. They call these forms the Hills of Monteregia, bearing rare gifts, jewels of the uprising.

And then — and this is even in the memory of our inheritance, its traces are in the genetic code, that most familiar and strangest of texts — there was the last great freezing. The ice caps fell from the North like a heavenly host, the ice came to cover the shield and the plain, the world was frozen and the great glaciers piled up for miles and miles, the vast blue towers carved below the surface in the sharp and severe architecture of the cold. The cold came down, the ice piled up; and then the foundations of the world shifted again, the heat returned, the air thickened, life exploded (now, again), and the ice retreated.

Receding north, the polar caps carved the landscape again: Grenville and Appalachia surrendered their softer parts to the longly grasping claws of the ice sheet, and the glacial pilgrims traced their way across the earth. We can still see the rubble they left behind, strewn across the landscape like trash: the pebbles, the sands. But who can imagine the weight of the ice? In its wake, the platform was sunk in a great depression, and before the rebounding of the rock in its slow way could come to pass, the stubborn law of the waters drew a new sea into a new basin. And so was the birth of the sea they call Champlain.

But the way of water is to flow: slowly, the sea became a lake; slowly, the lake became a marsh — peat bogs and swamplands for miles and miles, out to the crest of the continent, out to the shores of the ocean. Lakes still remain from this great migration; you can still swim in the afterwaters of this ancient sea. And just beneath the surface, waiting to be exposed by the unflinching forces of erosion, our platform remained — rich now with the marine sediment, rich and ready to be turned into life by the sun.

* * *

What are the forces at work in this story? The faults, the fluvial, the glacial: these are the forces. But force leaves no trace, no mark without resistance. What resists? The rocks resist, each kind differently. Where do the kinds of rock come from? Who can explain the difference and variety of forms? The rocks, born from the endless transit and gravity of the continents, pressed and cooled into different densities: some resist the beating of the waters, some resist the scraping of the glaciers. The contours of this ground of differences is the land we are given to know; and the slow rock and its mud, according to the incalculable chemistry of the sun, gives home to us, the quick creatures of flesh and bone, to the quickness of life, the patience of change.

* * *

We who know the islands know the three kinds: the ancient men, from the time before gender, the crags and withered remnants of forgotten mountains (they are called Montreal, Jesus, Perrot); the slick and current-drawn sisters, deposits from the silty withdrawal of the Champlain sea (the Bouchervilles, Saint-Therese); and the new ones, drawn up from the quarries and piled up not by the hands of the gods but by the hands of man (Saint-Helen, Notre-Dame) — these are the three kinds.

But who is this ‘we’? Anyone who tries to name multiply, name differently, name otherwise. The ‘we’ are those of us who, like children, have private or wordless names for every special dell and every curl of a river. We know that no one name can be the true name, but that some names are richer than others — more capacious, more generous, less steeped in violence. Then who belongs to the ‘they’, who know these places only in English, or only in French, only as they are described by the official maps? The boundaries between these groups are as inconstant and immaterial as the lines those maps might try to draw over the face of the earth. Radical namegivers in one spot recite tired conventions in another: in the morning I might remember Tiohtia:ke and Kahnawa:ke, in the afternoon I imagine strange names of the future, by evening I forget them all again.

* * *

But see also the famous greystone densify over the ages, carved into blocks and arranged according to the worked-up order of human space. See also the brecchia, dredged up from below the bridge, the famous rock of Stewart Museum. See the parks above the hidden quarries: Miron, yes, but also Villeray, Des Carrieres, Laurier, Pere-Marquette. See the arteries and capillaries of the waterways; the new artificial organs, the fake liver in the mountain, the pools just below the surface rising and falling to the breathy rhythm of our building and digging. See the new tunnels with their snaking trains carved into the rock like so many branches of nerves. See the great canal, spilled over with thoughts and hours of play, the feeling of belonging and the knowledge of surf. See the confluence still peeling away layer upon layer, see the three-headed hill lifted out of the plain. Stand atop the hill: see the Laurentians to the north, the thin and weathered strip of the Appalachians curling away towards the cradle of the civil war or out towards the bright houses of the Maritimes. The landscape is a story older than kept time — touch the rocks, learn its language.